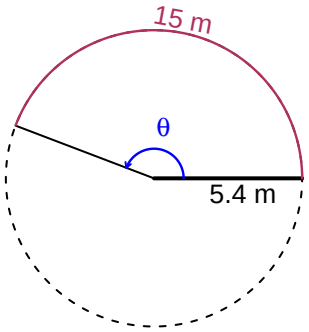
Name: Date:

Trig Final (SLTN v615)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 5.4 meters. The arc length is 15 meters. What is the angle measure in radians?

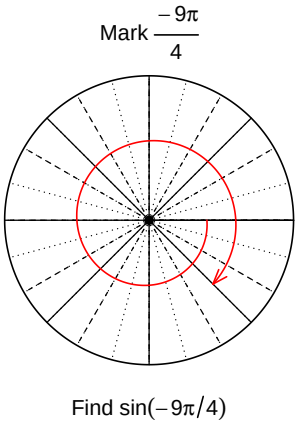


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

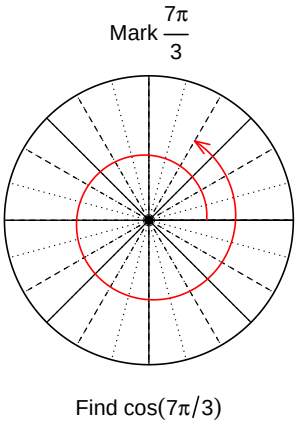
$\theta = 2.778$ radians.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-9\pi}{4}\right)$ and $\cos\left(\frac{7\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-9\pi/4)$



Find $\cos(7\pi/3)$

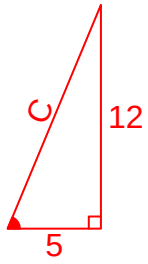
$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(7\pi/3) = \frac{1}{2}$

Question 3

If $\tan(\theta) = \frac{-12}{5}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

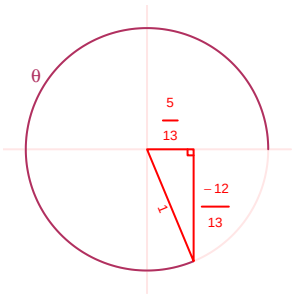
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$5^2 + 12^2 = C^2$$
$$C = \sqrt{5^2 + 12^2}$$
$$C = 13$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-12}{13}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.71 Hz, a midline at $y = 7.83$ meters, and an amplitude of 2.04 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.04\sin(2\pi 3.71t) + 7.83$$

or

$$y = 2.04\sin(7.42\pi t) + 7.83$$

or

$$y = 2.04\sin(23.31t) + 7.83$$